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AUTHOR Goodfellow, Paula; And Others
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ABSTRACT

This study compares (1) the English language use of limited-English-speaking foreign and native English-speaking college students in doing chemistry laboratory work, writing lab reports, and taking lecture notes; (2) the relationship of the language use to performance; and (3) the relationship of the foreign students' beliefs about their language capabilities and their actual laboratory performance. The research uncovered striking differences in organization and style of notes and lab reports. As a result of these findings, a minicourse was designed to address the language and cultural factors found to affect the foreign students' performance. Units developed for the minicourse include exercises related to lab report writing and lecture comprehension as well as a discussion of classroom interaction, especially behavior that suggests cheating, and the teacher's role. Appendixes include a sample worksheet to accompany a filmed lecture; examples of student lab report writing and suggestions to improve such writing; and a list of cultural differences that may affect academic performance. (MSE)

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EST: DESIGNING A MINI-COURSE FOR NON-NATIVE SPEAKERS OF ENGLISH IN A CHEMISTRY LAB COURSE*

Paula Goodfellow
Keiko Hirokawa
Jane Chisholm
Wendy Gaylord
The University of Michigan

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This paper is based on a case study of two non-native speakers of English in a Chemistry laboratory course at The University of Michigan. The study was started as part of a course in ESL theory taught by Larry Selinker, and continued in Selinker's English for Academic Purposes course. We got our idea for the paper from Val Goodfellow who is a teaching assistant in the Chemistry Department. In a discussion with one of the authors of this paper, in which he was relating the problems of two foreign students in his class, he made a comment something

Paula Jensen Goodfellow, a University of Michigan Ph.D. student, teaches at the ELI and has taught at Utah State University.

Keiko Hirokawa, a graduate student at The University of Michigan from Onomichi, Japan, teaches at the English Language Institute.

Jane Chisholm, M.A., The University of Michigan, taught at the English Language Institute and is teaching in Atlanta, Georgia.

Wendy Gaylord has taught with the British Council in Jakarta and at The University of Michigan, English Language Institute (ELI).

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like this, "Why don't you people ever come over to the real world and find out what kind of English your students need to know when they actually get into school?", not realizing that he had just reinvented the whole field of English for Special Purposes (ESP).

We decided to do some sort of a study to see what kinds of language skills foreign students needed in chemistry lab situations. After some debate we decided that the best way to go about this would be the case study approach. Although we would be sacrificing the generality of knowledge that might be gained through studying a large number of students, we felt that we could gain a deeper knowledge of the problems faced by these two students in Val Goodfellow's lab if we concentrated on them. We agreed with the view taken by Maxine Schmidt that we can be provided with 'knowledge about both the 'means of learning' and 'the language abilities' the learner must have to gain knowledge in his or her field' (1981:201) through the case study.

We set out to answer several research questions in our original study, three of which will be discussed here:

- (1) What differences were there among our non-native speaker subjects' use of language in doing lab work, writing lab reports, and taking lecture notes, and the use of language by the native speaker control subjects?
- (2) How did those differences affect their performance on lab reports and in the lab?
- (3) To what extent do the beliefs of these non-native speakers about their language capabilities reflect their actual performance in the lab?

In addition to answering these questions, we will present some suggestions for other researchers working in the same area and discuss the materials that we have developed in answer to the different language and intercultural factors that we found affected the students' performance. We had hoped to test these materials extensively before presenting them in this paper, but the undergraduate foreign student enrollment in the chemistry courses at The University of Michigan has gone down a great deal in the last year, and we were simply unable to find the students for our mini-course. However, we feel that these materials will still be of use to others working in the same area.

The students in our study were enrolled in Chemistry 227, a laboratory course that supplements the organic chemistry lecture course at The University of Michigan. There were about three hundred students enrolled in the course, but there were only fourteen students in the section that we studied. The class meets two times a week for four hours. There is usually a pre-laboratory lecture for the entire group by the professor, after which the class goes to the laboratory to work in smaller sections supervised by a teaching assistant. Each student works individually in the lab, and is expected to have read the relevant sections of the lab manual and to have prepared pre-lab notes. In addition, a lab report, which is graded by the teaching assistant, must be written following the lab. The students are also graded on a mid-term and a final examination.

The subjects of our case study included four female students. Two of the

subjects were non-native speakers of English and two were native speakers for control. They were:

- Saroya, a non-native speaker from Lebanon
- Pumsi, a non-native speaker from India
- Gloria, a native speaker
- Barb, a native speaker

Control subjects were used so that we could compare language skills used in performing tasks such as writing lecture notes and pre- and post- lab write ups. The native speakers were chosen on the basis of their test scores and evaluations by the teaching assistant. Gloria was chosen as an example of a very good student and Barb as an example of an average student.

Saroya, who was 25 years old, is originally from Harris, Lebanon, but attended an English medium school from the age of 11 while living in Sierra Leone, West Africa. She taught Arabic, her native language, in Sierra Leone before coming to the United States. She studied at Henry Ford Community College before entering The University of Michigan. She was in her junior year, majoring in both biology and medical technology, and had taken four chemistry courses, including the one we were studying. She scored 95 on the Michigan Test, and had been in the United States for two and a half years prior to the study.

Pumsi, age 19, grew up in Bharu, Gujarat, India. She was also in her junior year majoring in medical technology, and had taken five chemistry courses including this one. In addition to Gujarati, her native language and the language in which she was schooled, Pumsi speaks Hindi. She came to the United States four years prior to this study and spent her senior year of high school in Westland, Michigan. She also completed two years of college at Henry Ford Community College before entering The University of Michigan. She did not take the Michigan or TOEFL tests. Pumsi and Saroya met at Henry Ford Community College, and were roommates at the time of the study.

We collected data over a nine week period of time through questionnaires, interviews with the teaching assistant and the four subjects, observation of the lecture period, observation of the lab period, collection of lecture notes and lab reports from the four subjects, and discussion of the lab reports and notes with the teaching assistant. In developing the materials for the mini-course since the pilot study, we have discussed them with other teaching assistants and lecturers in the Chemistry Department.

Findings

Lecture notes and lab reports: The differences in organization and style in lecture notes and lab reports were striking. Gloria uses a variety of ways to highlight and distinguish information in her notes, including various color pens to denote different information, capital letters, quotation marks, exclamation marks, outline formatting, and boxing around words. Pumsi highlights headings by underlining and numbering points. In organizing lab reports, both native subjects clearly number steps of experiments and label comments, whereas Pumsi puts everything in one or two large paragraphs. Examples of this are found in Appendix B.

Pumsi records information in her notes using full sentences except when diagrams and formulae are included. She includes diagrams and formulae in her notes that were written on the board by the teacher exactly as they were displayed

on the board with few attempts at writing any explanation that the teacher may have given orally. On the other hand, Gloria includes explanations along with the diagrams that she copies into her notes or records the information verbally without the use of diagrams. Gloria does not record information in full sentences as Pumsi does; instead she uses a telegraphic style of writing, omitting verbs, articles and any other words that can be omitted. Pumsi's notes often contain functional explanations with less emphasis on the lab procedure. Saroya uses more explanations and descriptions of diagrams in her notes than Pumsi. (Throughout this paper, frequently only Pumsi's work will be mentioned in comparison to the native speakers' work. In general the same type of differences from native speakers were found in Saroya's work; however, the differences were more marked in Pumsi's notes and lab reports.)

Differences in content: Occasionally, Pumsi's notes lack information that Gloria's notes include (e.g. titles and technical explanations). Pumsi's notes include mostly graphs, calculations, chemical equations and formulae with little accompanying explanation. The teaching assistant pointed out that Pumsi's lecture notes mainly contain information that the lecturer had written on the board and information that had been spoken clearly and slowly enough that she could record it word for word. According to the teaching assistant's interpretation of Pumsi's lecture notes, she seems to leave out information if she does not understand what is said during lecture. She does not seem to indicate in her notes that she has either missed something or not understood something in the lecture (for example, by using a question mark). Her notetaking strategy seems to be to write down everything that is either on the board or spoken slowly and distinctly, and to ignore everything that she does not understand. Saroya's notes are similar to Pumsi's; however, the differences between her notes and the native speaker's are not so pronounced as Pumsi's and she seems to be better at writing down explanations to accompany diagrams copied from the board. The teaching assistant commented that Pumsi missed many main points while Saroya and the native speakers did not. Interestingly, Barb, the less proficient native speaker, also seems to try to write things down word for word as Pumsi did. She also is not as good at condensing ideas as Gloria.

In writing the procedure part of her lab report, which is supposed to be an accurate account of what the student did in the lab, Pumsi attempts to copy the instructions from the lab manual. She is unable to switch from the imperative form in the lab manual to the past tense that is appropriate. For example (with Pumsi's own grammar and spelling):

Inlab: the mixture of NaBr and alcohol are cooled into icebath than add 35 ml H_2SO_4 (Conc.) Slowely and Fit that Flask with condensor. add boiling chips into the mixture than heat the mixture to gentel reflux. Continue heating at reflux for 45 min. and Equip the flask for simple distillation (pg. 26) Distill the mixture, rapidly and collect the distillate in an ice bath cooled container.

Saroya seems to use this strategy at times, but she is more successful at using the correct tense than Pumsi.

The conclusions in Gloria's lab reports include qualitative information such as elaborate comments, suggestions, and predictions from the results, and excuses if her experiment did not turn out perfectly, as well as qualitative informa-

tion such as temperature, amount of product obtained and percentage yield. On the other hand, Pumsi gives brief factual statements of what happened. Barb's conclusions list only the basic facts of her experiments, but she also makes explanations of problems with her experiments that serve to take some of the blame for failure off herself.

Differences in language use. Gloria seems to use more technical words than Saroya (e.g. *calibrated*, *mother liqueor*, *clouded*, and *crop*), and Saroya seems to use more than Pumsi. Occasionally, Pumsi's notes contain incorrect, misspelled, or unidentifiable words (e.g. *mobil face* for *mobile phase*). Whereas both native speakers either use the passive or omit the subject from their sentences in lab reports, the non-native subjects mainly use declaratives with *we* as the subject in expressing a similar idea. In addition, the native speaker subjects appear to reduce adjective clauses to phrases more often than the non-natives. For example, Gloria writes "the observed melting point" where one of the non-native speakers would say typically "the melting point that was observed."

Materials

Lab reports: It was our original plan to develop a set of exercises that all students would do in the mini-course at the same time to correct some of the problems found in the non-natives' lab report writing. However, after attempting to develop these, we felt that in the short amount of time that we had for the mini-course, it would probably be more profitable to ask the students to bring in their own lab reports so that we could help them only in those areas which needed to be improved. In Appendix C there is a list of items for teachers to use in discussing students' writing with them. One might assume that the students' teaching assistant would be able to give them suggestions like this, and some teaching assistants do. However other teaching assistants do not have the linguistic sophistication to make specific suggestions about how students can improve their writing. Other teaching assistants are not interested in taking the time. Some teaching assistants professed not to care about grammatical errors or spelling problems saying that they understood foreign students have extra difficulties, but it seems likely that even these understanding teaching assistants are at least subconsciously influenced when confronted by a lab report containing a great deal of errors. Other teaching assistants said that they would not even accept papers that looked like some of Pumsi's. This list was compiled from problems that we found in our students' papers and from problems that our informants mentioned are common in all student's writing. The most recurrent theme from the chemistry teachers was that students need to present their information in a way that the teacher can find it quickly and easily. This is similar to the idea of the "busy reader" that Huckin and Olsen (1983) discuss in their book *English for Science and Technology* (see list of suggestions in Appendix C).

Lecture Comprehension: It was interesting to us that Saroya and Pumsi did not feel that they had problems with note-taking. Pumsi stated in her interview that her problems in chemistry were not caused by language. She said, "I take good notes in Chemistry." However from comparison with native speakers' notes, it is clear that she often missed vital information; materials were developed to aid in correcting this problem.

We felt that the most obvious problem in our non-native speakers' note-taking

strategy was the fact that they copied diagrams or formulae from the blackboard without really comprehending them and without adding any accompanying explanation from the lecture. We felt that this was one problem that we could correct somewhat during a short mini-course. We also wanted to work on some note-taking strategies such as developing a personal shorthand style instead of just trying to write the lecture down word for word. For people like Pumsi, who sometimes do not understand part of the lecture and therefore cannot write it down, we wanted to encourage students to develop a method of keeping track of things that they do not understand and dealing with them later in the way that native speakers do, by asking the teacher or another student. We especially felt that the first problem of merely copying information from the board was important because other researchers had observed it in other subject areas (Marengi and Rounds 1980). Our first problem in developing these materials was finding lectures to use in the mini-course. We did not have the money to make videotapes, nor would we have been able to give the lectures ourselves. We could not ask the chemistry teachers to take the time to give lectures for us to tape. Recalling that the Media Department at The University of Michigan carries films on a variety of subjects, we found that there were quite a few films and videotapes on chemistry, most of which were lectures and demonstrations. We chose several of these as the basis for our lecture comprehension materials. We selected fairly simple ones initially, so that the students would not have to contend with a great deal of new vocabulary, but rather could devote time to developing note-taking skills. The first lesson is a film with accompanying lecture notes that were written by us. The students watch this film as a group and afterwards discuss the style of notetaking on the worksheet—things they like and do not like about it, and ways that they would have done it differently if they had been taking the notes. We do not think that it is beneficial to force a method of notetaking on them, but we want them to begin thinking about their own strategies.

Next they view the film *Solutions*. (The exercise for this film is in Appendix A). In this exercise they watch the film once attempting to record the missing information and, most importantly, to add a description to the diagram. They are given time to discuss this work with the teachers and the other students, and then they view the film again. This process is repeated with two other films in which they are given less and less information. Each film contains diagrams or equations that must be copied along with explanations, because we felt that the lack of this skill was a very major problem in our subjects' notes. Students are encouraged to pass over things that they do not understand in order to keep up with the lecture, but they are also encouraged to indicate what they have not understood, so that they can find that information later. Our objective in the lecture comprehension material is not to teach vocabulary or new aspects of chemistry concepts, but rather to focus on strategies.

A brief analysis of the lectures in the first year chemistry course, which was not the object of this study, showed that the main emphasis of those lectures was to introduce and define new terms, and to demonstrate simple laboratory techniques. The Organic Chemistry course places less emphasis on explicit definition of terms, and focuses more on the theoretical aspects of chemistry. More time is spent on formulae and equations. Lab technique is discussed and procedures are sometimes illustrated on the board, but rarely demonstrated as in the introductory course. A teacher planning materials for either of these courses might want to keep those ideas in mind.

Findings

Personal belief system and intercultural problems: We felt that some of our subjects' personal beliefs and intercultural problems may have affected their performance in the laboratory as much as their language abilities. It is very difficult to separate the effects of the two. First, there definitely was a language problem. In addition, the subjects may have been hampered by language problems in study skills such as reading, but we did not examine this area. Another area in which it is difficult to differentiate linguistic or cultural interference is the interaction with other students and the teaching assistant during the lab period. We observed the lab period and found that both of our non-native speakers interacted much less with other students than did the native speaker, control students. While this may seem to be only a social problem, it may have had an effect on the students' performance, as they were not able to talk to other students to get advice about experiments, or to ask about notes that they had missed as the native speakers did. However, this did not seem to be the result of a linguistic inadequacy as both of our non-native speakers could carry on a conversation quite well. Unfortunately it seemed to be an attitude problem on the part of the native speakers in the class. Saroya once stated that, at first, none of the other students wanted to talk to her; then some of them realized that she was doing fairly well and decided that they did want to talk to her. However, she felt that it was only the weaker students that wanted to talk to her, and in her own form of reverse discrimination, she didn't want to talk to them. This lack of interaction with other students was beyond our control and was not dealt with in the mini-course.

However, we also noticed that Pumsi did not interact with the teaching assistant nearly as much as Saroya, who was a much better student, or the native subjects. In discussing this with them later, we found that it seemed to be related to their attitudes toward the teacher. Saroya felt that she had paid her money and that she had a right to ask him as much as she wanted because his job was to teach her. Pumsi, on the other hand, was frightened of the teaching assistant. His desk in the lab was near hers and she felt that he was always watching her. Pumsi seemed to believe that the teaching assistant's job was to watch her and catch her doing something wrong so that he could give her a poor grade. Later we found that he was unaware of the fact that it made her nervous when he worked at his desk, and that he did not believe that he was watching her. She interpreted the several times when he had caught her in a mistake as times when she had failed at something and had been caught, whereas he interpreted those same times as attempts to help straighten her out. Although we realize that cultural attitudes and personal beliefs are deeply ingrained and difficult to change, we included a discussion of the role of the teacher in our mini-course hoping that it would encourage the students to see the teaching assistant as a helper, not as an adversary. Traditionally in EST, lessons in culture are omitted; however we felt that cultural factors had affected our subjects' performance in the class (see Appendix D).

We ended our study of these two students as quickly as we could because we sensed that it was causing them some nervousness. We were afraid that we were affecting their performance in the lab. Shortly after the end of our involvement with the class an incident occurred that we felt was serious enough to be dealt with in the mini-course. Pumsi had an accident in the lab that destroyed

a large part of the product on which she had been working. She did not have enough time to redo the experiment, but the teaching assistant took the flask containing the experiment to his lab and extracted as much of the product as he could and told her not to worry about how little was left. She had to do some more procedures on that compound, turning it in a few days later. To his surprise she turned in a large amount of the finished product. Students are not graded on the amount of product they turn in, only the quality, and it is clear that Pumsi knew this because she had stated this earlier in one of her interviews with us. However, students are only supposed to turn in their own work and the teaching assistant considered this cheating. He gave her a very low grade on that lab report. Saroya and Pumsi came into his office and admitted that Pumsi had used some of Saroya's product, but they saw this only as one friend helping another. The teaching assistant still felt that this was cheating. He also felt rather hurt since he felt that he had gone out of his way to help Pumsi, and then she had lied to him. The two students then went to the professor in charge of the course and denied the entire episode. He came to the teaching assistant who told him that they had admitted it. The professor was angry and wanted to give them an *F* for the course, but the teaching assistant told him that he did not believe that it was a serious enough incident for that. It ended with them both getting a low grade on that one lab report. Based on this experience and our own experience as ESL teachers, we felt that we should include a discussion of the American concept of cheating in the mini-course. We use this incident as a basis for our discussion of cheating, and point out to students that although they may see it as merely a friendly gesture, it could be serious enough to hurt their grades or even cause them to be expelled. The handout contains a summary of information compiled by Keiko Hirokawa on different cultural views on classroom interaction and the role of the teacher. This information is to be used as a guideline for the teacher in planning for the discussion. There is also a copy of the handout about the cheating incident that we use for our discussion (see Appendix D).

Finally we would like to stress the importance of the subject specialist informant in our study. None of us knew much about chemistry when we began—two of us had had one year of college chemistry, but we really didn't know enough about Organic Chemistry to know if our analyses of the lab reports and lecture to investigate a field that otherwise would have been closed to us. (For more information on the use of informants, see Larry Selinker 1979).

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Appendix A:

Sample worksheet to accompany filmed lecture "Solutions"

This worksheet is a guideline for you to use as you listen to the filmed lecture. The major topic headings and a few extra notes are given for you. As you listen to the lecture, try to record more complete information under each subject area. There is also a diagram on this worksheet that you will see in the lecture. In the space below the diagram, write down the information from the lecture that explains what those diagrams are.

I. Examples of mixtures:

- A. _____
- B. _____
- C. _____

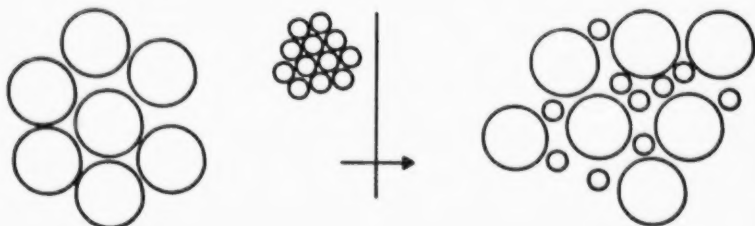
II. Tests for solutions:

- A. Filter paper _____
- B. _____
- C. _____
- D. _____

III. Types of solutions:

- A. Solid in liquid _____
- B. _____
- C. _____

IV. Process of forming a solution:



V. Increasing Rate of Solution:

- A. Stirring _____
 B. _____
 C. _____

VI. Process of Cooling:

Appendix B

Examples of Students' Lab Report Writing

(All are descriptions of the same procedure.)

Pumai: In lab: the mixture of NaBr and alcohol are cooled into icebath than add 35 ml H_2SO_4 (Conc.) Slowely and Fit that Flask with condensor. add boiling chips into the mixture than heat the mixture to gentel reflux. Continue heating at reflux for 45 min. and Equip the flask for simple distillation (pg.26) Distill the mixture, rapidly and collect the distillate in an ice bath cooled container.

Saroya: In lab: 0.30 mol of sodium bromide was added to 35 ml of H_2O and 0.30 mol of 1-butanol. This was mixed thoroughly and cooled in an ice bath. Slowly, 35 ml. of conc. H_2SO_4 added and the whole mixture refluxed until two layers appeared. (45 min.)

Gloria:

1. Combined the following in a 250 ml. round bottomed flask.
2. Mixed thoroughly (30.9 g. NaBr, 35 ml. water, 27.5 ml. 1-butanol)
3. Cooled in ice bath.

4. Added 35 ml of conc. H_2SO_4 to 250-ml flask while swirling and cooling.
5. Added boiling stones.
6. Refluxed mixture on a steam bath for approximately $1\frac{1}{2}$ hours then for 15 minutes using a heat element.
7. Corked solution and saved until 1-25-83.

Appendix C

Things to look for in improving students' lab report writing:

- Students should use some impersonal form of writing—either passive or omission of the subject of sentences as in Gloria's example above.
- Encourage students to look up spellings of new chemical terms in their lab book and to pay attention to spellings of common words. Many students may not see any importance in having words spelled correctly, but the grader will be affected by a great deal of misspellings.
- Students who are uncertain of their English can rely on the lab book in writing up their procedures, but they must learn how to change the instructions in the book to past tense so that they can report what they actually did, not just repeat the instructions in the book. For example, Purnai often attempted to use this strategy, but could not manipulate the tenses properly as in this example: "To recrystallized the benzhydrol add dropwise boiled 95% ethanol and filter that solution on steambath and add water until it PPT(Cr)."
- Any time information is given that could be displayed in a chart or graph encourage students to do so. The grader is not interested in hunting through a great deal of prose to find the few numbers or facts that he/she is interested in.
- Help students decide which information is essential and encourage them to leave out extraneous information. Writing style should be as concise as possible. For example, Saroya's example in Appendix B is acceptable but would be better if she condensed her paragraph into one or two sentences such as: "To a chilled solution (0 C.) of 0.30 mol NaBr and 0.30 mol 1-butanol in 30 ml H_2O was added 35 ml conc. H_2SO_4 slowly with stirring. The reaction refluxed ca. 45 minutes until two layers appeared." The informant did not feel that this was an unreasonable standard of writing proficiency to expect from sophomore level students.
- A general rule of thumb is to do anything that will help the grader find the essential information as quickly as possible.
- Encourage students to include comments in their reports about factors that may have influenced the outcome of their experiments.

Appendix D
Cultural differences that may affect academic performance

Student-Student Interactions

- Competition and heavy concern for grades among American students are frustrating to many students. (For example, in Japan personality development is considered more important.)
- American students are more individualistic and lack group cohesion. In many countries, students have a few close friends (more than classmates) and they do everything together—live, eat, shop, and study. To these students, American students appear to be cold and unhelpful.

Teacher-Student Interactions

- American teachers' informality is new to many students who are used to keeping distance between their teachers and themselves. (For example many students are surprised by teachers that allow students to call them by their first name or to go out to eat or drink with their students.) Many students enjoy this informal relationship with their teachers and take advantage of it, but other students still try to maintain distance.

Teaching Methods

- Many students are used to large, tightly structured, teacher-centered lectures and are not used to the "give-and-take" concept in American education (Passive learning vs. Active learning).
 - Small group work and expected in-class participation are difficult.
 - Critical thinking is a difficult process to learn.
 - Independent thinking and opinion formation (vs. memorization) are new.
 - A wide variety of opinions offered by teachers and students for "open-ended" questions is confusing and difficult to accept.
- In many countries the size of the class is larger than that of American classes and thus, attendance is not as noticeable (Class notes can often be purchased).
- Some students remain silent in class because they believe asking questions and giving their own opinions interferes with the class. Some students are embarrassed to admit that they don't understand.

Teacher image

- In many countries teachers are considered "untouchable" and have god-like status, because they are very experienced and knowledgeable in all areas of study and life.
- Students take their teacher's view without question and American teachers' open questions and wide varieties of opinions expressed in class give some students an impression that the teacher doesn't understand.

- American teachers are specialized. Their narrow knowledge of one field contrasts with the Japanese and Chinese view that a teacher should have general knowledge.
- American teachers' manners and dress are too informal to some students.
- Different teachers teach different things or ways in the same course.

Homework

- The amount of reading and writing assignments is heavy.
- Frequency of homework may be different.
- Many students have very little experience in using libraries.

Cheating

- Plagiarizing—Many students don't know how to write papers (Footnoting, quoting, etc.).
- Sharing homework, tests, etc., with other students may come from the idea of helping/supporting friends.

Textbooks

- Many students believe that textbooks are absolutely correct and perfect.
- The practice of picking and teaching only the most important parts of the text may seem strange.
- The availability of texts is poor in some countries. Some students may not know how to use a text.

Tests and Quizzes

- Some students are not used to standardized objective exams, but are used to writing long essays and having oral exams at the end of each term.
- American students have frequent tests and quizzes, and students may feel frustration and anxiety.

Sex

- Some countries have segregated schools. Therefore:
 - Some female students may feel frightened of a male teacher.
 - Female teachers may have difficulty in winning respect from some male students.
 - Some students may have problems in working with the opposite sex.

Handout for students in workshop to discuss

You just got your lab report back with a "zero" on the top with an added note: "Come

see me after class." You quickly look over the lab report and cannot figure out what you did to deserve such a low grade.

During your lab last week you had an accident that destroyed much of the product you had been working on. Unfortunately, you did not have time to redo the experiment so you informed the lab instructor about your problem. To help you out, he took the flask containing your product and extracted as much of the product from the substance as possible. He told you not to worry about the small amount of product, to just turn in what you had and that you would receive a grade on the quality, not the quantity of the product.

You felt uncomfortable turning in such a small amount even though you knew that it would not affect your grade. So you asked your close friend, another foreign student, for some of her product since she had plenty to spare. You then turned in what you felt was a reasonable amount of product.

After class you go up to speak with the lab professor, as instructed, and he asks you why you turned in such a large amount of product last week after having finished the experiment with a much smaller amount. Unaware that you have done something wrong, you tell him that your friend donated some of her product since she had extra. The lab professor then tells you that he considers this cheating and, as a result, he gave you a zero and will stick by that decision. In addition, he says that he's also going to give your friend a zero since he played a part in the incident. You explain that you feel that this is not cheating, just an incident of "one friend helping another," but it makes no difference to the professor.

You feel that you and your friend have been treated unfairly and that this was not a matter of cheating, so you decide to appeal the lab professor's decision to the department head. The result is even worse. He is so angry that he says he may instruct the lab professor to give you an F for the course or have you brought before a university board that investigates charges of cheating and could expell or suspend you.

Luckily, your lab professor is a little more understanding and convinces the department head that the incident was not serious enough to merit a failing grade for the entire course. You still do not quite understand the seriousness of what you did and you certainly did not cheat knowingly and intentionally, but in the end, you and your friend accept the zero and drop the matter.

Reactions/Questions for consideration:

1. What are your reactions to this incident?
2. Given your academic experience in your own country, do you consider this incident improper or unusual?
3. In your opinion, what would the reaction of the lab professor have been if this had taken place in your country?
4. Define the word *plagiarism*. How is plagiarism similar to the incident above? Given the reactions of the professors to the chemistry incident, do you think an incident involving plagiarism would be considered as serious or even more serious?
5. What other kinds of behavior might be considered as cheating?